

IBM Software Group

Steps to Better Requirements Management

Business Analyst World 2010

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Agenda

- The Case for Improving Requirements Management
- Good Requirements Management Practices
- No Excuses!



Requirements Management - The Driver

"Analysts report that as many as 71 percent of software projects that fail do so because of poor requirements management, making it the single biggest reason for project failure"

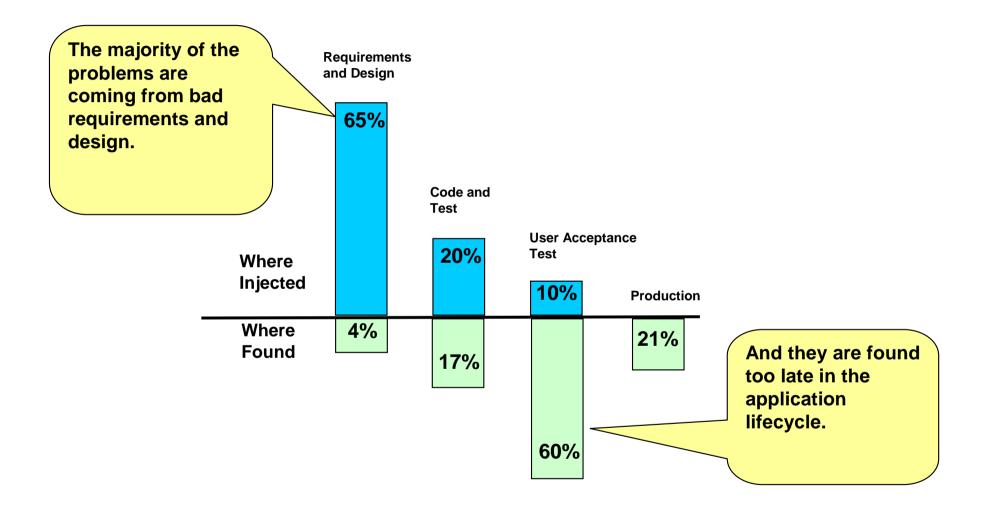
CIO Magazine

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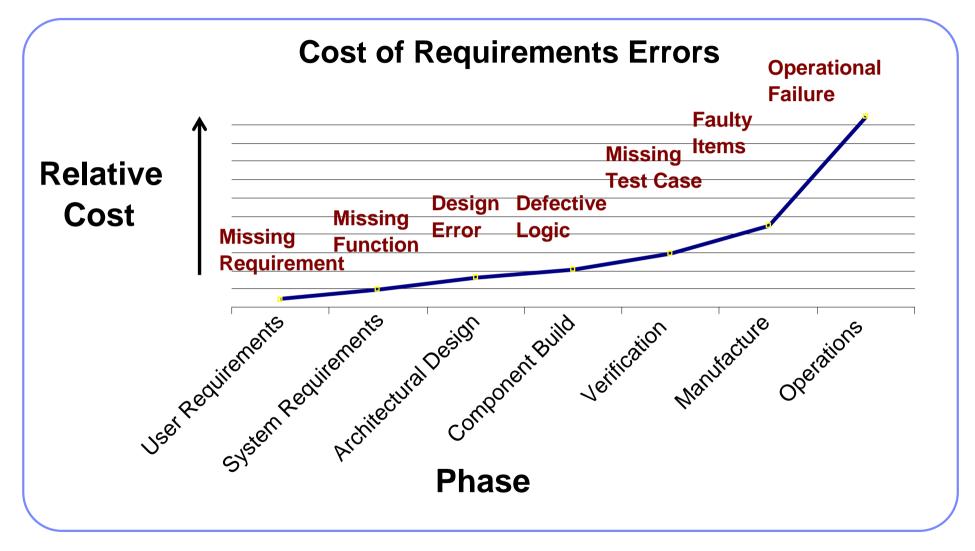
Start at the beginning.







Cost of requirements errors

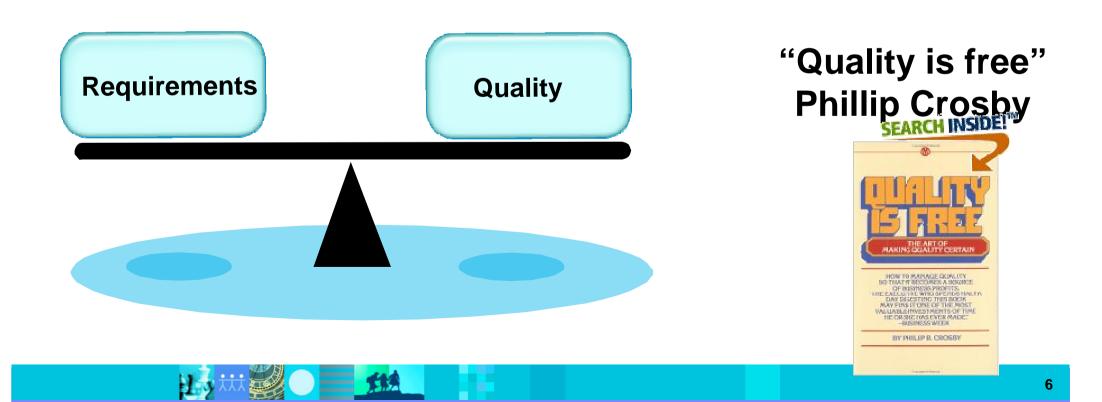


The message is simple. The later you catch an error the more it costs to fix! It will never be cheaper to catch errors than in the Requirements Phases.



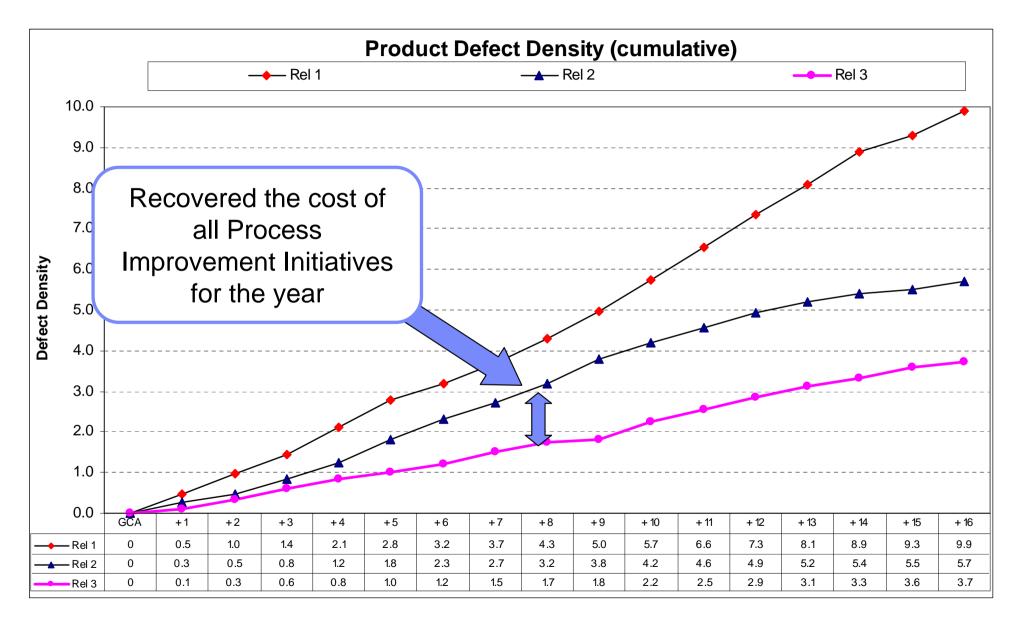
Why are better requirements needed?

Requirements Management is a High Leverage Activity



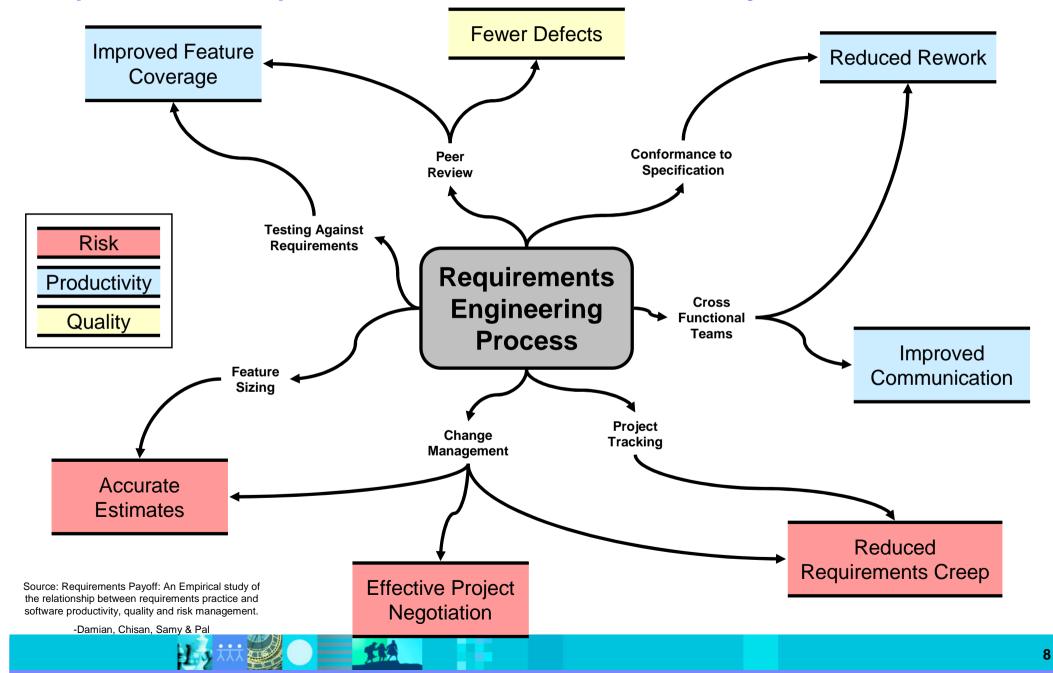


Unisys - Return on Investment





Impact of Requirements Practice - Unisys







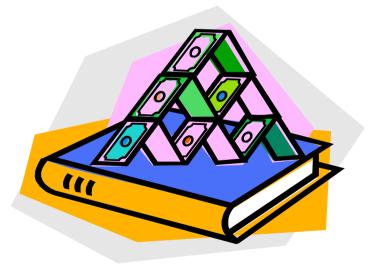
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Whole-life Management

Requirements form the basis for:

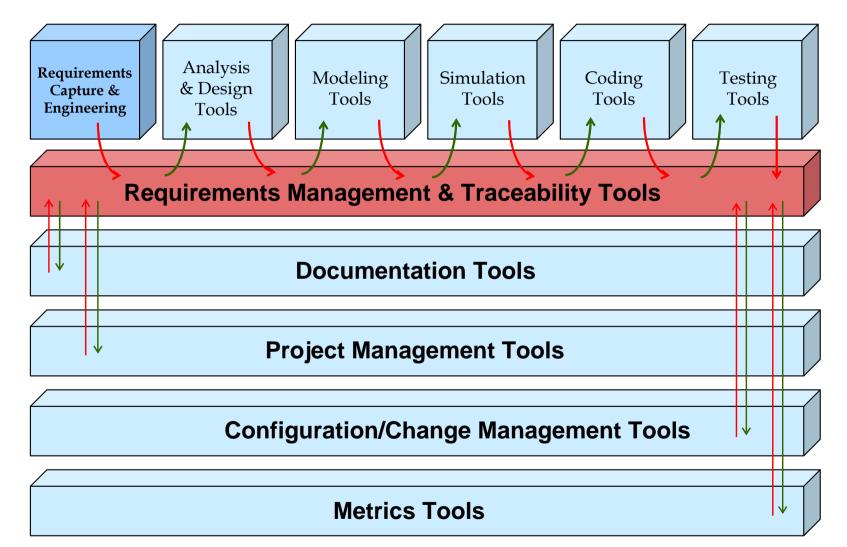
- project planning
- risk management
- acquisition management
- trade-off
- change control
- qualification / testing
- deployment
- maintenance / support / enhancements
- retirement / disposal







Requirements through the lifecycle





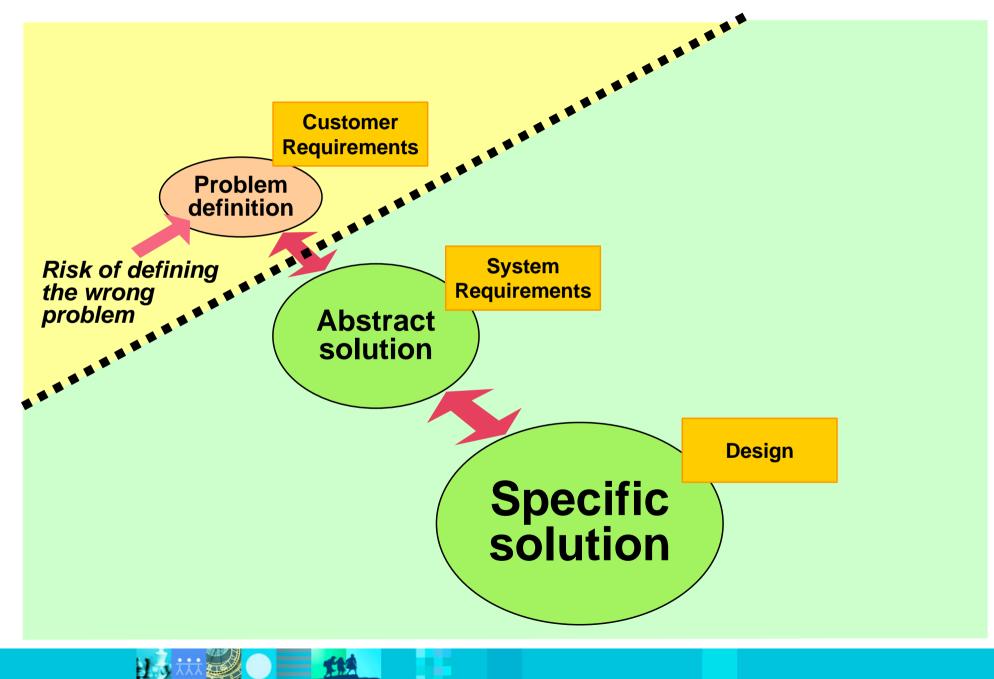


GOOD PRACTICES

- 0. Recognise you may be up for more work, not less!
- 1. Understand the difference between the problem & the solution
- 2. Use concise, clear, consistent language in statements
- 3. Focus on documents as well statements
- 4. Drive testing from requirements
- 5. Create, review and use traceability



Good Practice 1: Distinguish between Problem and Solution



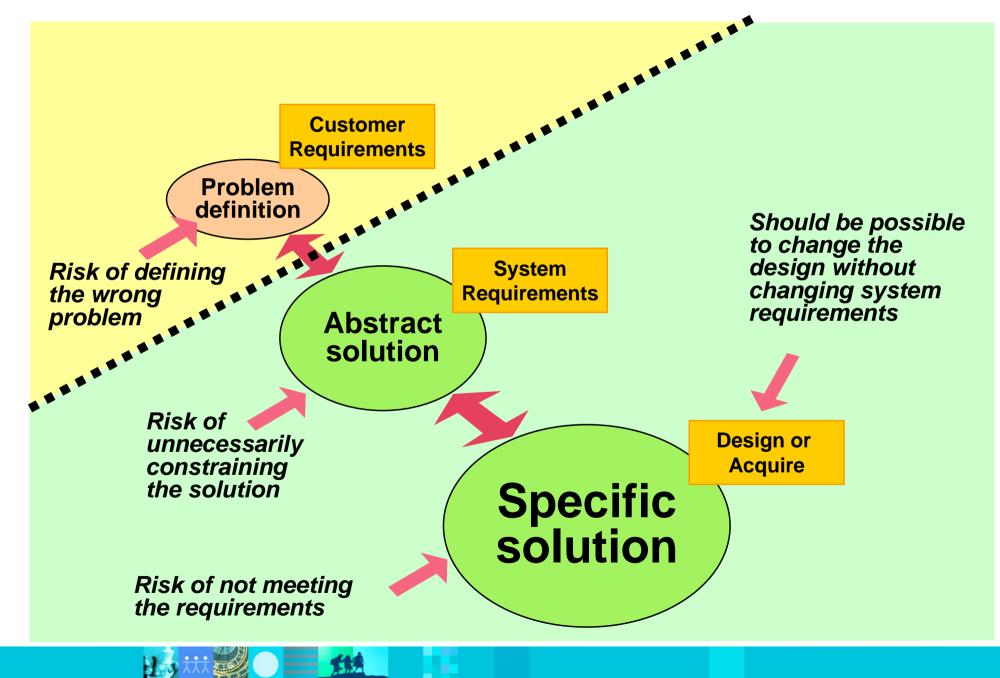
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Example **7**7 Problem () 000 .



Good Practice 1: Distinguish between Problem and Solution



Differentiating Problem and Solution

Problem

Customer requirements

- A description of the problem and its context
- Results that stakeholders want from the system
- Do not define the solution, other than for environment
- Quality of results
- Owned by stakeholders or their representatives (e.g. marketing)

"The user shall be able to"

Solution

System requirements

- An abstract representation of the solution
- What the system does
- Do not define the design
- How well it does it
- Owned by systems engineers

"The system shall do"



Good Practice 2: Use concise, clear, consistent language

Each requirement statement should be:

- 1. Individual: each statement is a single traceable element
- 2. Unique: each statement is uniquely identified
- 3. Clear: each statement is clearly understandable
- 4. Precise: each statement is precise and concise
- 5. Abstract: does not impose a solution on the next layer
- 6. Testable: each statement can be validated/verified
- 7. Quantified: each statement has acceptance criteria



Six Things to Avoid

- 1. Rambling: conciseness is a virtue
- 2. Let-out clauses: such as "if that should be necessary"; they render the requirements useless
- 3. Multiple requirements: often indicated by "and", "or", "but", "however"
- 4. Vague terms: usually, generally, often, normally, typically, user friendly, versatile, flexible
- 5. Wishful thinking: "100% reliable", "please all users", "run on all platforms", handle all unexpected failures", "upgradeable to all future situations"
- 6. Speculation: stick to what you know



Good Practice 3: Focus on documents as well as statements

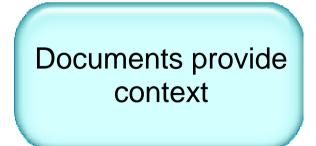
- Need to balance two aspects:
- Making each requirement statement manageable
 Focus on the individual statement of requirement (...later)
- Making the requirements document understandable
 Focus on the requirements document structure

Specifications Contain Statements

Two concerns:

- Focus on the individual statement of requirement:
 - Language
 - Clarity, preciseness
 - Identity, traceability
- Focus on the requirements document:
 - Understanding context
 - Assessing completeness
 - Identifying repetition/conflict
 - Navigating/searching requirements







Seven Criteria for Requirements Documents

Each requirements set should be:

- 1. Complete / Sufficient: all requirements are present
- 2. Consistent: no two requirements are in conflict
- 3. Non-redundant: each requirement is expressed once
- 4. Modular: requirements statements that belong together are close to one another
- 5. Structured: there is a clear structure to the requirements document
- 6. Satisfied: the appropriate degree of design traceability has been achieved
- 7. Evaluated: the appropriate degree of test traceability has been achieved

Define an outline structure at the outset, and improve it as you go

Good Practice 4: Drive Testing from Requirements

- Of every requirement statement, ask:
 - "How will you know if the need has been met?"
- Improves the way the requirement is expressed
 - Is it quantified?
 - What are the success criteria?
 - Add requirements to make system testable
- Plan the tests now, not later:
 - What kind of tests will be used?
 - When will the tests be performed?
- Preparing the tests may take months or years:
 - Collect requirements for test facilities
- Trace tests to requirements
 - Include tests in impact analysis



Principles of Requirements-Driven Testing

- Plan Tests Early
 - To understand the requirements better
- Conduct Tests Early
 - Phase injection vs. phase detection
- Relate Tests to Requirements
 - Assurance requirements are met
- Relate Defects to Requirements
 - Understand impact of defects
- Measure Progress against Requirements



Good Practice 5: Create, review and use traceability

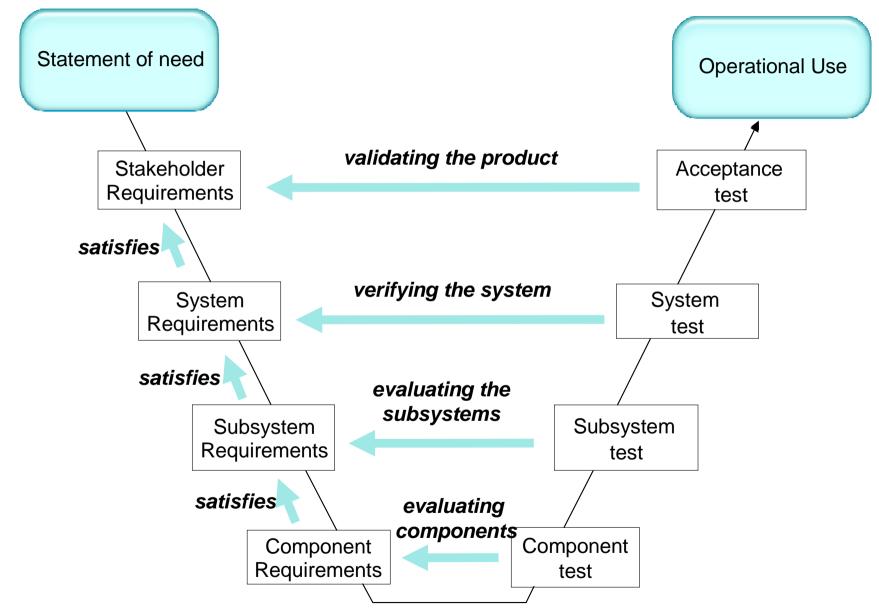
DEFINITION OF TRACEABILITY

- Documenting how high-level goals are transformed into low-level goals.
- Understanding how needs are satisfied
- Understand how requirements are qualified (tests, inspections, trials)



Traceability in the lifecycle

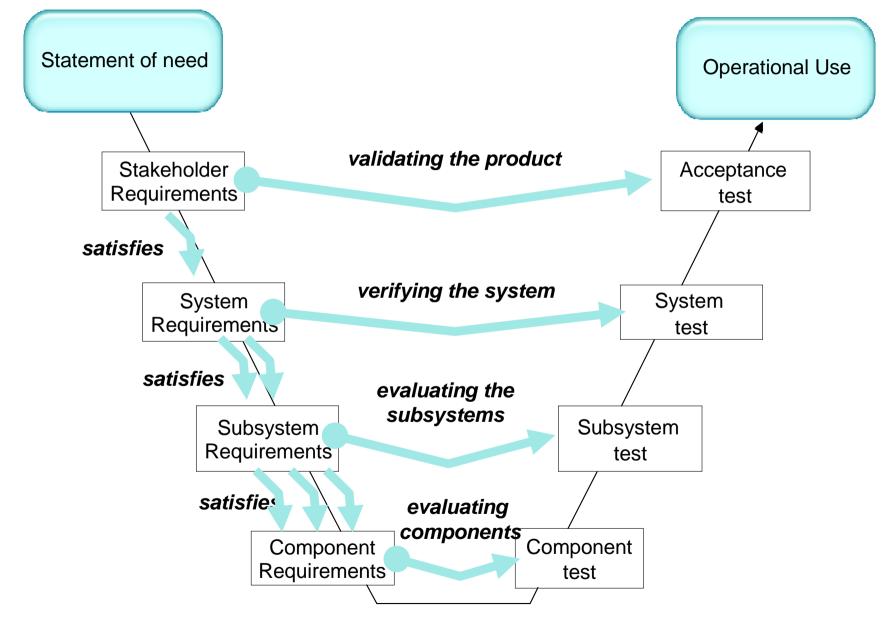
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Impact Analysis

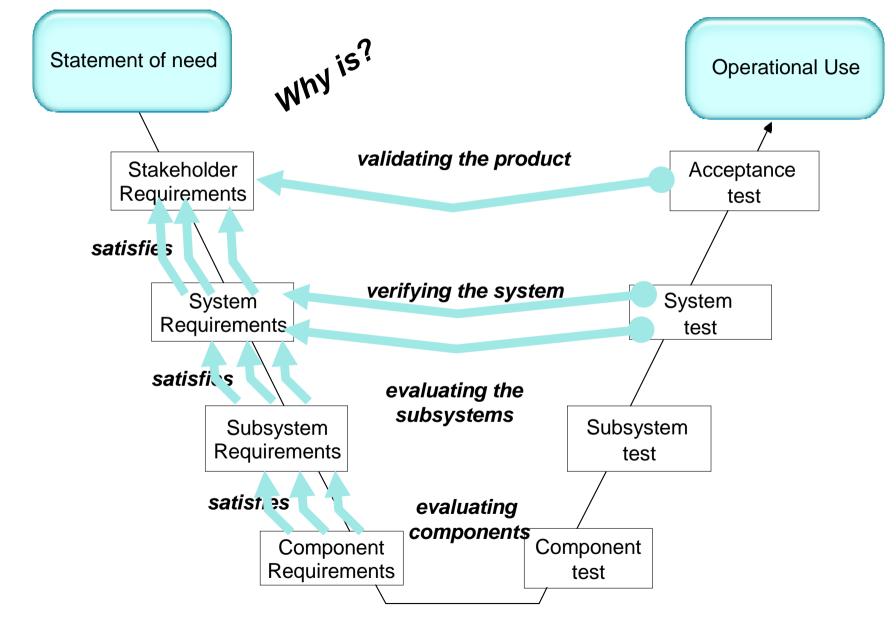
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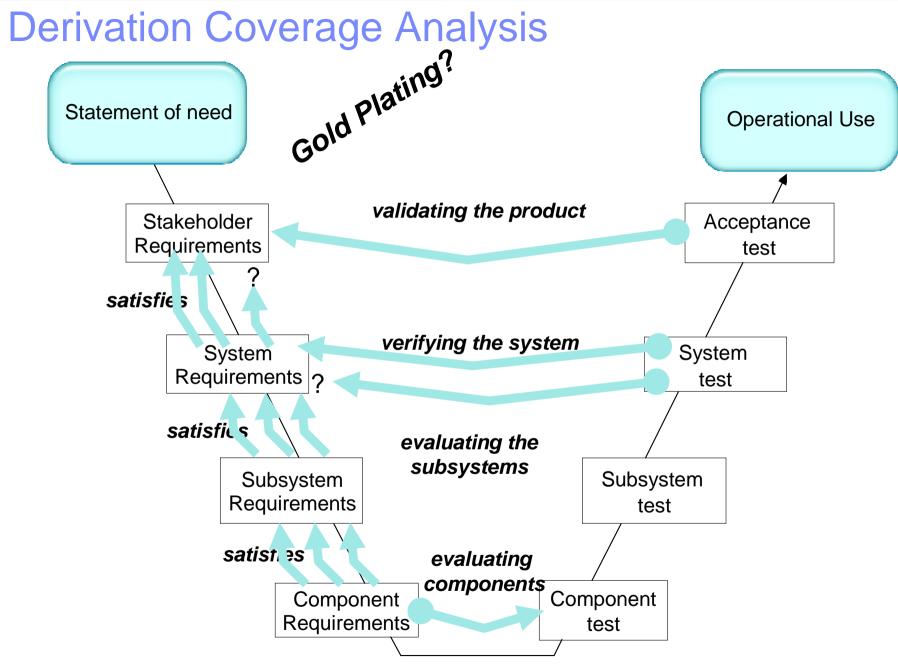




Derivation Analysis

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Three Criteria for Reviewing Traceability

The EMS shall control a turbo-charged, gasoline, direct injection engine with a displacement range between 1.0 litres and 1.4 litres.

- This requirement is satisfied by providing a fuel system capable of
- supplying fuel at a sufficiently high pressure, so ensure that the mixture is
- homogeneous and combustible.
- controlling the booster pressure to ensure optimum fuel combustion.
- feeding up to 6 injectors, since a 1.4 litre engine may have 6 cylinders.

The fuel system shall manage up to 6 injectors operating in a pressure range of between 3 bar and 300 bar.

The fuel system shall manage a high-pressure pump with a displacement of between 500 mm³ and 1000 mm³.

The EMS shall control the booster pressure ranging from 0 bar to 3 bar with a precision of ± 30 mBar.

- 1. **Coverage:** is every requirement traced?
- 2. Sufficiency: are the traced lower-level requirements sufficient to satisfy the higher-level?
- 3. **Necessity:** are all the traced lower-level requirements *necessary* to satisfy the higher-level?



Identify the element to trace

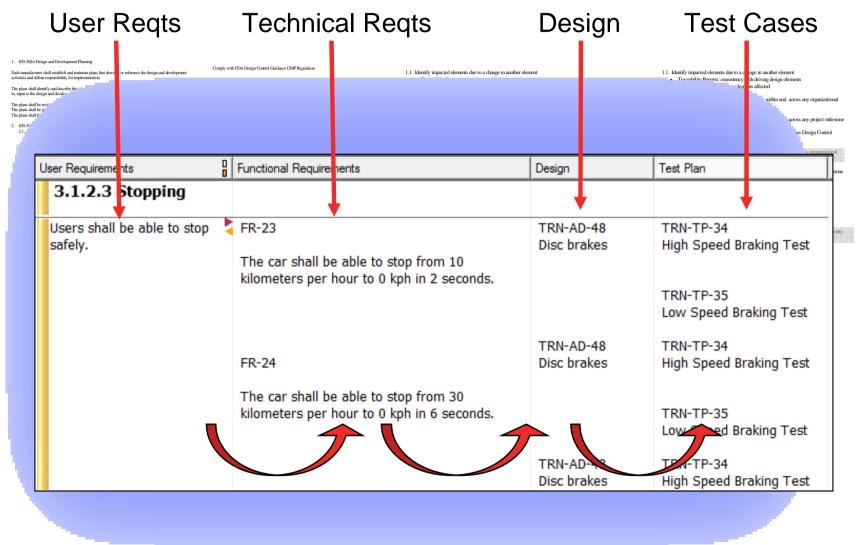
System Spec

WORD

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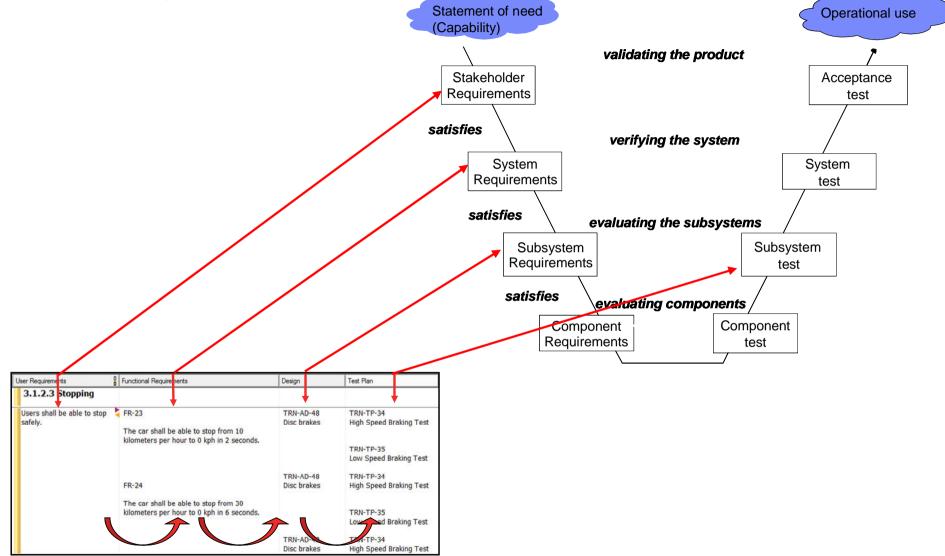
Traceability view



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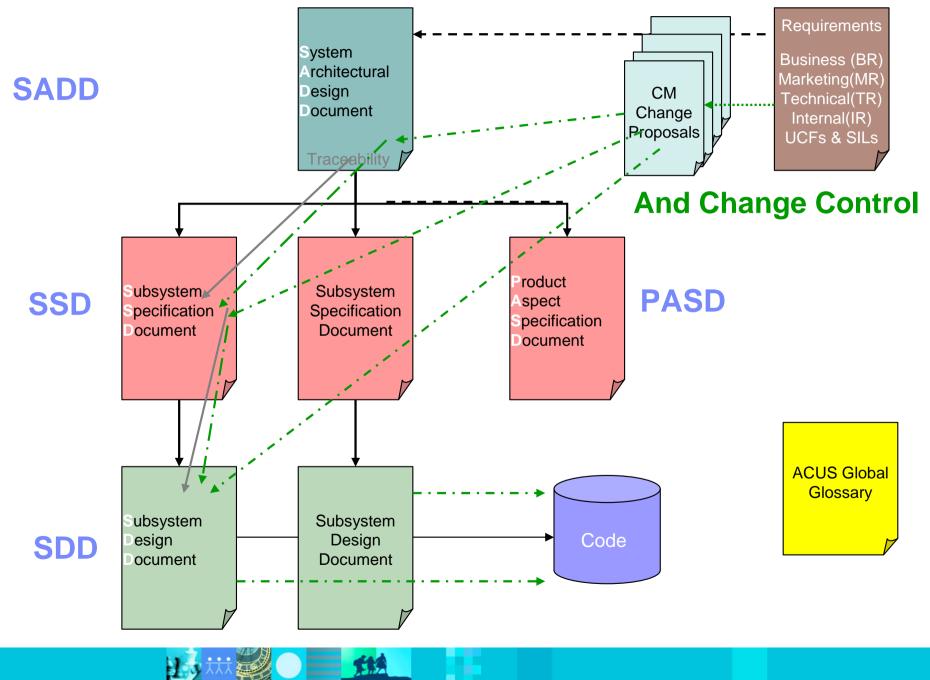


Traceability view





The Unisys Documentation Set





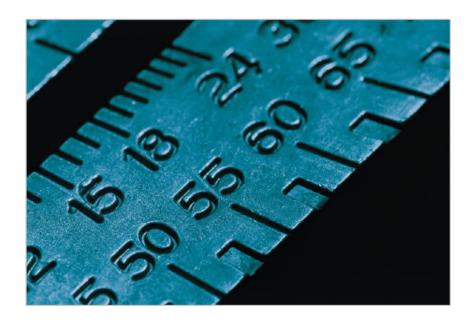
Questions

- Can you quantify the improvement of your organisation's software development process over the past 5 years?
- Do you know if projects where you spend more relative effort in testing result in relatively fewer defects? How about projects where you spend more in requirements analysis?
- Based on what quantifiable information do you select development technologies for a project (modeling method, development environment, coding language, etc)?



Measurement & Process Improvement

- You can't improve what you don't measure
- Keeping the metrics burden low
 - Automation of metrics
 - Quality
 - Productivity





Monitoring Progress based on requirements state

- Number (or %) of input requirements agreed
- Number (or %) of input requirements that have derived requirements linked to them
- Number (or %) of derived requirements in each requirement state (e.g. Draft, Proposed, Reviewed, Rejected)
- Number (or %) of derived requirements that have qualification activities linked to them
- Number (or %) of derived requirements in each qualification state (e.g. No qualification agreed, Qualification agreed, Qualification suspect)
- Number (or %) of input requirements with a change pending



Real Results

Project

- Methodology Process Mentor
- Requirements Management in Rational DOORS
- Build some Agile techniques
- Testing in HP Quality Centre
- Change Requests
 - Expected 20
 - Actual 3
- UAT
 - Expected 20
 - Actual 2

- Rework
 - Expected 20
 - Actual 0
- Requirements Acquittal
 - Expected 80%
 - Actual 125%
- Business Benefits Realisation
 - Expected 80%
 - Actual 110%



Excuses!

. . .

- We're too busy fighting fires to do requirements management
- We're too busy delivering projects to do more requirements management
- We need to get on with the next project, there's no time
- We don't need another tool
- Our people are not skilled enough
- We're doing the process/method first, then we'll look at tool support



Agenda

- The Case for Improved Requirements Management
- Good Requirements Management Practices
- No Excuses!

